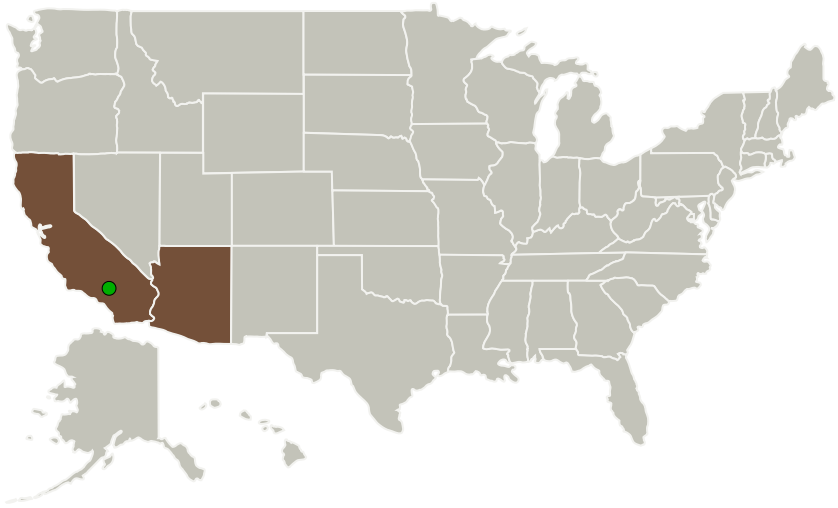
Multi-Fidelity Multi-Strategy and Multi-Disciplinary Design Optimization Environment, Phase I

Completed Technology Project (2010 - 2010)

Project Introduction

Multidisciplinary design and optimization (MDO) tools developed to perform multi-disciplinary analysis based on low fidelity computation methods have been used in aircraft conceptual design for decades. These tools have been proven very effective for simple problems and mostly have been developed as a single codes. However, as analyses have become more complex and the need to consider more design factors crucial, such codes have grown so large as to be inconceivable and difficult to maintain. Nowadays, the design optimization process of a modern airplane must account for all failure modes and behavior constraints. In addition, it should cover manufacturing constraints and limitations on available resources, such as power, weight, and cost, simultaneously. This has to be done in an integrated way, so that the effects of any change in the design on all constraints and behavior measures are accurately modeled, and all interactions and trade-offs among design variables and disciplines are allowed to affect the design. ZONA Technology (ZONA) and its team member (Virginia Polytechnic Institute and State University), hereinafter referred to as "the ZONA team", propose in Phase I to develop a multi-fidelity, multi-strategy and multi-disciplinary design optimization environment, called the M3 Design Optimization Environment (M3 DOE) that consists of a three-layer optimization strategy, a multi-fidelity aerodynamic discipline, and a finite element analysis including outer mold line morphing and topology re-meshing capability. The M3 DOE allows the designer to select an appropriate optimization strategy and an aerodynamic method with an appropriate fidelity to obtain an optimum design with desired accuracy within the allowable time constraint.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
ZONA Technology, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Scottsdale, Arizona
Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California

Primary U.S. Work Locations	
Arizona	California

Project Transitions

January 2010: Project Start

July 2010: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139257)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

ZONA Technology, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

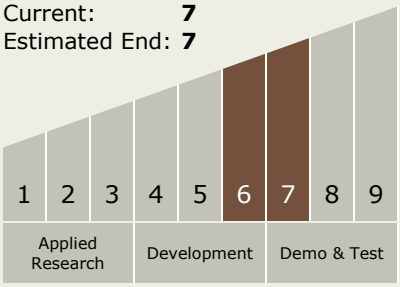
Carlos Torrez

Principal Investigator:

Dong-hwan Lee

Technology Maturity (TRL)

Start: **6**
Current: **7**
Estimated End: **7**



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Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - TX11.5 Mission Architecture, Systems Analysis and Concept Development
    - TX11.5.2 Tools and Methodologies for Performing Systems Analysis

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System